element selected from any one or more of the elements in the list of elements, but not necessarily including at least one of each and every element specifically listed within the list of elements and not excluding any combinations of elements in the list of elements. This definition also allows that elements may optionally be present other than the elements specifically identified within the list of elements to which the phrase "at least one" refers, whether related or unrelated to those elements specifically identified. Thus, as a non-limiting example, "at least one of A and B" (or, equivalently, "at least one of A or B," or, equivalently "at least one of A and/or B") can refer, in one embodiment, to at least one, optionally including more than one, A, with no B present (and optionally including elements other than B); in another embodiment, to at least one, optionally including more than one, B, with no A present (and optionally including elements other than A); in yet another embodiment, to at least one, optionally including more than one, A, and at least one, optionally including more than one, B (and optionally including other elements); etc.

[0166] In the claims, as well as in the specification above, all transitional phrases such as "comprising," "including," "carrying," "having," "containing," "involving," "holding," "composed of," and the like are to be understood to be open-ended, i.e., to mean including but not limited to. Only the transitional phrases "consisting of" and "consisting essentially of" shall be closed or semi-closed transitional phrases, respectively, as set forth in the United States Patent Office Manual of Patent Examining Procedures, Section 2111.03.

1. An apparatus for distributing a quantum key, the apparatus comprising:
- an input waveguide;
- a first ring resonator, evanescently coupled to the input waveguide, to receive a first pulse of light via the input waveguide;
- a second ring resonator, evanescently coupled to the input waveguide, to receive a second pulse of light via the input waveguide;
- an output waveguide, evanescently coupled to the first ring resonator and the second ring resonator, to receive the first pulse of light from the first ring resonator and the second pulse of light from the second ring resonator; and
- at least one modulator, operably coupled to at least one of the first ring resonator, the second ring resonator, and the output waveguide, to delay at least one of the first pulse of light or the second pulse of light so as to generate a photonic qubit in an X-basis or a Z-basis

2. The apparatus of claim **1**, wherein:
- the first ring resonator is configured to emit a third pulse of light; and
- the at least one modulator is configured to delay the third pulse of light with respect to the first pulse of light so as to form a $|+\rangle$ state in the X-basis.

3. The apparatus of claim **2**, wherein the at least one modulator is configured to delay third pulse of light with respect to the first pulse of light by a period equal to an integer multiple of an oscillation period of a carrier of the first pulse of light.

4. The apparatus of claim **1**, wherein the at least one modulator is configured to delay the first pulse of light with respect to the second pulse of light so as to form the photonic qubit in a $|-\rangle$ state in the X-basis.

5. The apparatus of claim **1**, wherein the at least one modulator is configured to delay the first pulse of light with respect to the second pulse of light by a period selected to create a π phase difference between the first pulse of light and the second pulse of light.

6. The apparatus of claim **1**, wherein the at least one modulator is configured to delay the first pulse so as to form the photonic qubit in a state in the Z-basis.

7. The apparatus of claim **1**, wherein the at least one modulator comprises a phase shifter, operably coupled to the output waveguide, to vary a phase difference between the first pulse of light and the second pulse of light.

8. The apparatus of claim **1**, wherein the output waveguide comprises:
- a receiving section;
- a propagation section to guide the first light received by the receiving section; and
- a loop section having at least one segment evanescently coupled to the propagation section so as to couple at least a portion of the first pulse of light back to the propagation section,
- wherein at least one of the first ring resonator and the second ring resonator is evanescently coupled to the propagation section of the input waveguide.

9. The apparatus of claim **1**, further comprising:
- a detector, optically coupled to the input waveguide, to monitor an intensity of the first pulse of light.

10. The apparatus of claim **1**, further comprising:
- a phase randomized light source, in optical communication with the input waveguide, to provide the first pulse of light and the second pulse of light.

11. The apparatus of claim **1**, further comprising:
- an attenuator, operably coupled to the output waveguide, to attenuate an intensity of at least one of the first pulse of light and the second pulse of light so as to create a decoy state.

12. The apparatus of claim **1**, further comprising:
- a phase shifter, operably coupled to the output waveguide between the first ring resonator module and the second resonator module, to apply a phase shift to the second pulse of light.

13. The apparatus of claim **1**, further comprising:
- a photonic integrated receiver to detect the photonic qubit, wherein the photonic integrated receiver comprises:
  - a substrate;
  - a coupler fabricated in the substrate and comprising:
    - a first input waveguide to receive qubits provided by a first party;
    - a second input waveguide to receive qubits provided by a second party;
    - a first output waveguide; and
    - a second output waveguide;
  - a first detector coupled to the first output waveguide; and
  - a second detector coupled to the second output waveguide.

14. A method of distributing a quantum key using a transmitter comprising an input waveguide, a first ring resonator evanescently coupled to the input waveguide, a second ring resonator evanescently coupled to the input waveguide, and an output waveguide evanescently coupled to the first ring resonator and the second ring resonator, the method comprising: